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AUTHOR Huff, W. A. Kelly
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ABSTRACT

In the mid-1980s, the National Association of Broadcasters (NAB) reformed the National Radio Systems Committee (NRSC) as a liaison between receiver manufacturers and amplitude modulation (AM) broadcasters to promote unity in upgrading AM transmission and reception, and to aid AM in narrowing the sound quality gap with frequency modulation (FM). In 1982, the Federal Communications Commission (FCC) announced that no single system for broadcasting AM stereo would be picked by the government. Of the five competing AM stereo systems, the marketplace effectively eliminated three within 2 years. The NAB believed the keys to enhancing the sound quality appeal of AM radio to be improving both the technology for transmission and for reception. The NAB and the NRSC were able to convince the FCC to begin a series of notices of inquiry, rulemaking proceedings, and policy changes for improvement of AM, such as reduction of interference and relaxation of many regulatory rules. Contrary to broadcaster sentiment, in 1989 the FCC unanimously decided on a technical standard for AM broadcasting which included an "RF mask." Broadcasters complained of the high cost of the new standard. Criticism for the failure to upgrade gradually in the 60-year history of AM must be shared by both the FCC and the AM industry. As with FM in its struggle to gain parity, the process for AM's revitalization will take a number of years. (Five notes are included; 82 references are attached.) (RS)

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Southern States Communication Association
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Mass Communication Division

W.A. Kelly Huff, Ph.D.

Assistant Professor
West Georgia College
Dept. of Mass Communication
Carrollton, Georgia 30118

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In the mid-1980s, the NAB reformed the National Radio Systems Committee (NRSC) to serve as a liaison between receiver manufacturers and AM broadcasters. The purpose was to unite the broadcast industry to expedite improvement of AM transmission and reception to enable AM to compete more effectively with FM. Soon, the NAB and NRSC were able to convince the FCC to investigate ways to improve the AM medium. Through a series of notices of inquiry, rulemaking proceedings, and policy changes, the Commission began wholesale improvement of AM, such as reduction of interference and relaxation of many regulatory rules.

The broadcast industry responded favorably to the Commission's plans. For several years, the industry had been frustrated by a seeming lack of AM concern demonstrated by the FCC. In 1982, after five years of deliberation, the Commission left the AM stereo system standard decision to the marketplace. Never before had the FCC left such a task unfinished.

The FCC's renewed interest in AM was unexpected, but welcomed. At the urging of the NRSC, AM broadcasters and receiver manufacturers had already begun to voluntarily upgrade equipment. The NAB financed a super radio receiver to demonstrate the quality AM could achieve. Should the FCC adopt the NRSC voluntary standards and make them mandatory, AM would have a chance to once again compete with FM.

By examining both the NRSC and FCC standards, the pros and cons of AM improvement become clearer. The object of this paper is to document and examine AM stereo, the NRSC standards, and the FCC's AM improvement proceedings.

THE NRSC AND THE FCC: WORKING TO CHANGE POLICY AND PROCEDURE TO NARROW THE DISTANCE BETWEEN AM AND FM

Efforts to improve broadcast sound can be traced to 1925, when WPAY, New Haven, Connecticut, crudely broadcast one channel of its sound on one frequency and another channel on a separate frequency, or AM-AM, in an attempt to produce a stereo effect (Graham, 1979, p. 53; Sunier, 1960, pp. 29-30). Similar stereo undertakings emerged through the years, all requiring two separate transmitters, or stations: AM-FM, FM-FM, TV-AM (FCC, 1977, p. 34910; Sunier, 1960, pp. 113-118). Until the 1950s, no serious FCC consideration was given to true stereo broadcasting (FCC, 1958; Tlamsa, 1978, p. 26; Feldman, 1984, p. 37).

The FCC took its first official look at stereo broadcasting for AM, FM, and TV in 1958 (Feldman, 1984, p. 37; Stereo specs, 1959, p. 26; Montgomery, 1986, p. 12). Eventually, stereocasting was allowed on FM but denied for AM and TV. FM lagged far behind the other broadcast media and despite its clean, static-free sound, needed help to survive (Stereo stimulates, 1960, p. 30). More significantly, it was considered technologically impossible to properly employ stereo on AM (FCC, 1977, p. 34910; Sterling, 1970, p. 468).
Subsequently,
stereo for AM and TV was "postponed indefinitely" (p. 30).

Within ten years after FCC approval, FM stereo slowly began to attract listeners (Stereo AM: Coming, 1982, p. 58; NAB's agenda, 1985, p. 58). In 12 more years, FM totally reversed AM's hold on the ratings. Seventy percent of all radio listeners tuned to AM in 1973, but by 1985 FM controlled 70 percent of the total radio audience (AM: Band, 1985, p. 35; FM share, 1985, p. 1). Ten more years of continuing decline would leave AM radio with no listeners (AM: Band,

1985, p. 35).

AM faced its most critical times. To combat FM stereo's superiority, AM programmers tried voice-only formats, such as news, information, and talk, which relied little on high fidelity sound required by music. However, the strategy failed (AM: Band, 1985, p. 46). The obvious solution lay in improving transmission and reception of the AM signal. AM's first great hope was the FCC's inquiry into the feasibility and necessity of stereo in 1977. However, after five years of intensive deliberation, the FCC in 1982 revealed it would leave the decision to the marketplace for the first time in Commission history (FCC, 1982, p. 17). In the Report and Order, the Commission described the move as "a bold, new step" (p. 17). Sterling (1982) agreed, calling the FCC's AM stereo decision "a benchmark" in the "regulation of changing technology" (p. 137).

With the exception of color television, the FCC had always acted thoroughly and decisively in transmission standards proceedings. Even in 1953, when the FCC "abandoned its earlier approval of the CBS color system and adopted the National Television Standards Committee system" (Garvey, 1980, p. 516), the Commission rectified the problem. As in the case of color television, the Commission chose an AM stereo standard, but quickly rescinded and never picked a replacement.

The first seven years of the AM stereo marketplace gave the industry considerable time to formulate other solutions for improving AM. The first was the National Association of Broadcasters' (NAB) formation of the AM improvement Committee in October 1983 "to collect, to study and to analyze problems facing AM transmission and reception and to develop ways to improve technical quality in AM broadcasting" (Rau, 1985, p. 84). While conceding that "AM stereo is

without a doubt an improvement," the NAB preferred not to include stereo "within the scope of the committee's mandated work" (p. 84).

Eventually, NAB involvement in AM improvement issues prompted formation of the National Radio Systems Committee (NRSC) "to recommend standards to the AM receiver industry and to the FCC" (AM group, 1985, p. 7). By early 1987, the group developed "voluntary" preemphasis/deemphasis' standards for AM transmission (Texar Inc., 1987, p. 1).

Apparently inspired by the NRSC and other industry prodding, the FCC in July 1987 began an inquiry into either setting its own standards, or requiring implementation of the NRSC's parameters on the AM band (AM uniformity, 1987, p. 85).

This paper will provide brief descriptive histories of AM stereo, the NRSC standards, and the FCC's AM improvement proceedings. Explanations are offered for developments and decisions. Hopefully, such an undertaking will at least partially fill a huge gap in the literature for such an important series of events.

AM Stereo: From Governmental Standards to the Marketplace

When the FCC began its study of AM stereo, the objective was to pick a technological standard. Five AM stereo transmission systems were proposed by five manufacturers: Motorola, Magnavox, Belar, Harris, and Kahn/Hazeltine. By September 1978, the FCC (1978) determined "that rules should be proposed for the transmission of AM stereo," expressing doubts about which of the systems might best satisfy the needs of broadcasters p. 4). The Commission added: "Resolution of these matters to the Commission's satisfaction is necessary before any standards are to be adopted" (p. 4).

On April 9, 1980, the FCC "tentatively" selected the Magnavox system as the industry standard (FCC, 1980, p. 2). However, numerous

"petitions and pleadings" convinced the Commission to reconsider the Magnavox decision (p. 2). Still, the FCC (1982) was confident "a single system would better serve the public interest" (p. 5). Indeed, broadcasters who filed comments wanted the Commission to pick a standard (p. 7).

Between 1980 and 1982, the FCC began to examine its regulatory role. After almost two years of deliberation, the FCC announced on March 4, 1982, that no single system for AM stereo would be picked by the government. Instead, the matter would be placed in the hands of the marketplace (p. 16). The Commission explained in its docket that selection of only one system would be highly tenuous" (p. 9). Further, the FCC indicated that public interest would perhaps be better served by allowing the consumer to have a more direct impact on the process:

> It clearly represents a change from tradition. However, it signifies a more effective and more efficient approach to achieving the public interest goals of the Commission. Although some costs may be incurred . . . we believe that pursuing the course of action set forth herein best serves consumer well-being and furthers the Commission's mandate to regulate in the public interest. (p. 17)

Sterling (1982) observed: "On the surface, the decision appeared to be a collective throwing up of hands, as the Commission staff admitted its inability to make a clear-cut choice among the systems, all of which were compatible with existing AM technology" (p. 137).

The Commission was Chaired by free market supporter Mark Fowler, who led the FCC's move to deregulation. Fowler strongly believed in following the print model. Fowler explained: "The day will come when we will regulate only technically and only in the narrowest sense, and treat everything else as newspapers are treated. The antitrust laws will apply" (FCC prescribes, 1986, p. 35). Fowler's legal assistant added: ". . . the litmus test is whether a rule of

policy would or could be imposed on newspapers, books, and magazines. If not, it must be eliminated" (Herwitz, 1985, p. 185).

Commissioner Anne P. Jones, another marketplace advocate, was pleased with the decision because a standard would have eliminated future technological improvements: ". . . if we don't set standards, new players can come in. And, the new players may improve the system. If we put a standard on some technology, there's no real incentive to improve on it" (Jones: Staunchly, 1982, p. 70).

Only Jones and Fowler were totally in favor of a marketplace decision. Of the remaining Commissioners, three preferred a standard but bowed to marketplace pressure because they believed the FCC and all its attendant researchers incapable of picking the proper system. The other believed the Magnavox decision should have stood. Discontentment with the reversal led to marketplace support. The uncertain role of the Commission during deregulation affected AM stereo, particularly since both proceedings were being handled by the FCC simultaneously. Never before had the Commission failed to set a standard.

Despite the confusion, the FCC appeared confident the best system would ultimately prevail, and emphasized its responsibility would be ensuring that all systems complied with federal technical regulations. AM stations were allowed to begin stereo broadcasting with either of the five systems (FCC gives up, 1982, p. 36).

The marketplace years

The FCC maintained its hands-off policy during the first seven years of the marketplace, and intervened only to police technical violations and complaints.

General Motors' Delco Division was the first receiver manufacturer to align with one system, and was soon followed by nearly

40 other manufacturers in choosing Motorola. No receiver manufacturers ever aligned themselves with any other company.

By 1984, Sony and Sansui introduced receivers capable of decoding of all five systems, which were surprisingly rejected by the marketplace. The price of the units was higher than that of Motorola-only receivers, but the difference was rather insignificant considering the potential. The huge lead forged by Motorola probably had more to do with the failure of multisystem receivers than any other factor.

Within the first two years of the marketplace, three of the five systems were eliminated, leaving only Motorola and Kahn. As Motorola slowly gained favor in the marketplace, Kahn's system remained status quo at best. In fact, several stations in major markets deserted Kahn for Motorola, citing listener discontent for the switch. Still, the total number of AM stereo-equipped stations remained relatively small. The number of AM stereo stations reached about 650 by the end of 1988 -- or, about 10 percent of all AM stations.

Often, apparent AM stereo progress was hindered by a lengthy series of legal actions filed by Kahn, Inc. In addition to formal complaints against Motorola and receiver manufacturers, Kahn persistently attacked the firm through industry-wide mail and media campaigns. While Kahn may have slowed Motorola's progress, he did nothing to improve the standing of his own system. In a sense, Kahn's determination initially may have been admired and perhaps respected. After so many defeats, the broadcast industry eventually became weary of Kahn's persistence -- preferring instead to proceed with resurrecting the fortunes of AM radio.

Texar Inc., a Pennsylvania manufacturer, delivered a petition to the FCC asking for a standards decision. The company acknowledged

the limited success of the marketplace in eliminating three of five systems. However, Texar officials emphasized the detrimental effects the Kahn-Motorola battle had on retarding the growth of AM stereo.

Press Broadcasting also petitioned the FCC, not for a system standard, but to require all receivers to be multidecoders. The Commission could act on selecting a standard transmission system, but in reality only Congress could act on receiver requirements. When the Commission responded in 1988, it indicated that receiver manufacturers had the privilege of making their own decisions concerning stereo or other enhancements.

Meanwhile, the National Telecommunications Information Agency (NTIA), a branch of the U.S. Commerce Department, became involved. After conducting two different studies, the agency determined that Motorola was a de facto AM stereo standard -- not the de facto standard. The NTIA conclusion damaged Kahn's prospects of becoming the standard. The FCC (1988) acknowledged the NTIA's findings and agreed enough evidence existed to confirm the marketplace was working toward a de facto standard.

The FCC completed its obligation to comment on the Texar and Press petitions, as well as the NTIA study. The FCC's categorical response addressed all the pertinent issues and maintained its stand. After seven years in the marketplace the FCC concluded that the benefits of staying out of the matter far outweighed the negatives.

The FCC staunchly maintained the marketplace was working, particularly in light of the overwhelming numbers of supporters of Motorola. In the opinion of the Commission, there was a clear broadcast industry preference "towards establishing a de facto standard" (p. 404). The Commission wrote:

> Petitioner's arguments and presentations do not convince us that Commission intervention at this late date would prove beneficial to the public. Rather, while only ten percent of all AM stations have installed stereo capability, the market is working towards the selection of an industry standard. . . . the field of competitors has narrowed and the majority of stations now choosing to broadcast in stereo seem to be selecting one particular technical system. Thus, there is no indication that the functioning of the marketplace does not reflect the level of AM stereo service desired by the public or that active encouragement of this service feature through mandatory standards setting would be an appropriate way to contribute to the improvement of the economic condition of the AM service. (p. 404)

To petitioners' claims that the FCC's failure to pick a standard negatively affected the proliferation of AM stereo, the Commission responded: ". . . we conclude that the rate at which broadcasters have chosen to install AM stereo capability cannot be attributed to our decision to not establish mandatory industry standards" (p. 404).

Further, the Commission noted the disadvantages of picking a standard from among Kahn and Motorola:

> If the first AM stereo proceeding is a guide, action by the Commission to select an AM stereo standard would be a lengthy process. Given the complexity of the issues and the strong interest of the competing parties, any decision made by the Commission probably would be followed by requests for reconsiderations and subsequent appellate litigation. During the course of such proceeding, the AM stereo market would be subject to a further uncertainty that would delay the introduction of service into the market. After all of this administrative delay, there still would be no guarantee that the standard selected would be any better than one the marketplace might choose. Thus, action by the Commission to choose an AM stereo standard would be expected to hinder, rather than promote, development of this service feature and would not benefit the industry or the public as petitioner predicts. (p. 404)

After years of hope the FCC would pick a standard, the Commission's rejection of all petitions placed the standards decision once and for all "squarely into the AM broadcaster's [sic] court" (An end, 1988, p. 5). Throughout the marketplace, many in the broadcast industry continued to believe the FCC would step in to pick a standard. Still, the FCC's reluctance to do so was discouraging to them, but hardly surprising.

AM stereo appeared at times to be losing its luster and appeal to many in the broadcast industry. Continuous delays in the development of AM stereo and rapid advancements in other attractive technologies combined to disillusion even the most important players. However, with the realization that the FCC certainly can never again reconsider its AM stereo position, the broadcast industry forged ahead with other AM improvement ideas -- such as ridding the AM band of annoying noise interference.

The NAB's NRSC Plan for AM Improvement

The NAB believed the keys to enhancing the sound quality appeal of AM radio to be improving both the technology for transmission and for reception. Upon upgrading the basic transmission and reception of AM, stereo would have a better chance at working. Perhaps the FCC privately justified its AM stereo standard indecision through the existing poor state of AM technology. As an enhancement to basic AM technology, stereo would only be a noticeable improvement when demonstrated under the best of conditions -- not the worst.

In late 1983, the NAB formed an AM Improvement Subcommittee to investigate the problems of AM. After meeting eight times in just over a year (Mustering forces, 1985, p. 91), the group offered eight specific recommendations: (1) "industry-wide" promotion; (2) a central base for "AM technical information"; (3) asking AM operators "to limit boost of audio frequencies above 12kHz before transmission"; (4) enhance antenna capabilities; (5) study "new antenna designs"; (6) "research transmitter transient distortion"; (7) "work closely with receiver" producers; (8) and, try to find ways to eliminate radio frequency (RF) "interference from electrical devices" (Rau, 1985, p. 80). While AM's technical shortcomings were obvious, the NAB believed

promotion to be the most important (and difficult) of the suggestions. For instance, no amount of technical improvement would matter without courting listeners "to experience how good AM can sound" (p. 80).

In early 1985, the NAB replaced the AM Improvement Subcommittee with the NRSC (AM group, 1985, p. 7) to serve as a "forum" for the broadcast industry and a catalyst for carrying out improvement plans (Mustering forces, 1985, p. 31). The NRSC was charged "to create, collect, study and analyze current technical problems facing" AM radio and to facilitate methods for improvement (AM group, 1985, p. 7).

The FCC's AM improvement plan

Meanwhile, the FCC was busy with plans of its own, considering several major options: relaxing duopoly rules; eliminating AM-FM non-duplication rules; expanding the AM band; allowing synchronous transmitters, or translators; and, reducing interference from both other stations and from RF sources, such as home appliances and other electronics. The Commission reasoned, by allowing operators to own stations with overlapping signals each station could utilize one single staff, transmitting common programming to a much broader area. Expansion of the AM band (from 1600 to 1700 khz) would also aid in reducing adjacent channel interference by allowing more spacing between stations. Additionally, the FCC was considering permitting AM stations increased coverage by installing synchronous transmitters in certain areas, boosting a station's signal greater distances. Simultaneously, the Commission was pondering the same consideration for FM.

Non-duplication rules were put into place during the 1960s. Since the inception of FM in the 1940s, many AM-FM combos broadcast the same programming on both stations. FMs were struggling and unable to stand alone. In the 1960s, the FCC believed FM stations could better

serve the public interest by offering the listener more alternative programming. Conversely, with AM's drastic decline in audience, the Commission believed the band in need of help from FM (FCC determined, 1985, pp. 40, 42).

NAB petitions FCC for AM action

In October 1985, the NAB petitioned the FCC to act on AM improvement. The NAB believed the NRSC could provide a means for the broadcast industry to achieve some agreement on how to best improve AM broadcast transmission and reception. In the petition, the NAB suggested a combination of altering both technical regulations and policies:

> While certain of the technical problems experienced by AM radio are governed by the laws of physics and may not easily be given to total or even partial cure, many other factors in the "AM radio problem" may be alleviated through not only industry action but the cooperation of government as well. It is our view that through a combination of technical and policy rule changes -- all in conjunction with efforts of broadcasters and broadcast-related equipment manufacturers to achieve improvements in areas where new regulation is not needed -- AM radio may become a more competitive medium capable of providing increased service to the American public. (NAB's agenda, 1985, p. 58)

The NAB agreed with the FCC on duopoly rules, raising power on some stations, non-duplication, and electric interference elimination. However, the NAB opposed translators if it "would result in a 'diminution' of service by other AM stations not using them" (p. 58).

By the end of 1985, FCC Mass Media Bureau Chief James McKinney promised that rule changes for AM would begin to take shape by Spring 1986 (Hughes, 1986, p. 3). (AM improvement, 1986, p. 3). In February 1986, McKinney announced that the AM improvement report was nearing completion and would probably be ready in March. He also applauded the work of the NRSC (Hughes, 1986b, p. 1). The "Report on the Status of the AM Broadcast Rules" was submitted to the FCC Commissioners by

McKinney in April 1986. McKinney stated:

> There is no other service for which such a review is more appropriate. AM broadcasting already is more than 60 years old, and while we have made great strides in updating the AM rules, some of the basic assumptions are little changed from the earliest days of the Commission. Thus, the purpose of this report is to explore the full range of AM broadcast regulation. We believe it is important to recognize the far-reaching changes that have taken place in AM broadcasting, and it is important to continue the effort to create a competitive and unregulated marketplace. Our overall goal in this exercise is to relieve radio broadcasters of outdated licensing and regulatory constraints, thereby freeing their entrepreneurial ingenuity to compete more effectively in the marketplace. This, in turn, will enable them to better serve the listening public. (McKinney's insight, 1986, p. 37)

McKinney emphasized AM improvement would be focused on areas deemed most important by the Commission. Apparently, higher priority was given to noise reduction, while duopoly was considered long-term at best. McKinney cautioned: "It certainly will take many years, assuming grandfathering should go in" (p. 37).

The FCC initially turned its attention to RF interference and approving post-sunset operation for AM daytimers. The RF matter was delayed by great debate between county, state, and federal government officials. Though the Commission included among its rules RF "exposure guidelines of the American National Standards Institute," governments in various localities were overriding FCC-authorized communications facilities (NAB position, 1986, p. 63). RF was considered hazardous to public health. Therefore, local officials interpreted the FCC's reductions in RF to also include broadcast signals, meaning harsh standards at the local level (p. 63).

The Commission reached an agreement with Mexico to permit AM daytimers to remain on the air for two hours after sundown. Longer hours of operation would mean more opportunity to increase advertising revenue. The rule change was the first victory in the quest for AM improvement (Magnitude modulation, 1986, p. 130).

NRSC's voluntary frequency response standards

On January 10, 1987, the NRSC "approved a voluntary standard for AM broadcast frequency response" (Texar, 1987, p. 1). The group had no authority to require the standards, but the move was significant in that it was accomplished between a large number of prestigious broadcasters and receiver manufacturers (p. 1). Previously, most development of equipment for transmission and reception was polarized. "By developing standards for AM transmission that complement technology found in new generation AM receivers, the AM listener will experience much improved fidelity" (CRL Systems, 1987, p. 1).

On January 15, 1987, the FCC (1987) issued public notice on its status and intentions concerning AM improvement, dividing the notice into three categories: "near term actions," "longer-term actions under consideration," and "deferred subjects" (p. 3705). The most notable of the "near term actions" were the immediate proceedings "on synchronous transmitters" and the "'duopoly' rule" (p. 3705). "Longer term actions" included allowing daytime-only stations to broadcast at night and increased power authorizations (p. 3705). The Commission "deferred" comment on improved antenna designs and AM stereo, but "invited" input "to develop information . . . in formulating future actions to be pursued" (p. 3705).

By June, the FCC indicated plans to soon "begin a major, long term examination of a number of its AM technical standards" with the intention of proposed rulemaking (Hughes, 1987a, p. 4). The April 1986 AM status report had outlined a number of areas of concern. However, the Commission believed it necessary to update archaic standards of assessment before pursuing the matter further. Jim McKinney, FCC Mass Media Bureau Chief, explained:

> The criteria that we are using now we have been using for the last 50 years. . . . Now that we have much better information and much better tools to work with, we think it is appropriate to have an inquiry as to whether those old, existing criteria that have been in use for many, many years are correct. Should they be strengthened or relaxed? (p. 4)

At a June 4, 1987, meeting, the NRSC reaffirmed plans to move ahead with RF mask studies. The chief concern was adapting all stations, no matter how old, to fit within acceptable guidelines. Additionally, the NRSC announced one company had "shipped over 150 NRSC processors since the preemphasis standard was approved" (Zavistovich, 1987a, p. 4). Also at the meeting, the NAB discussed "upcoming FCC regulatory proceedings," especially "AM technical standards" (p. 4).

The FCC's inquiry into AM technical parameters

In July, the FCC officially began its inquiry "into the technical parameters that defined the coverage of AM stations" (AM: Looking, 1987, p. 84). In particular, the Commission outlined immediate priorities: (1) station coverage areas and problems of interference; (2) "radiated emissions of AM stations"; "skywave and groundwave propagation"; "methods of measuring interference"; and, a study of antenna problems caused by location and "skywave interference" (p. 85). In effect, the top priority as indicated in these plans was the problem of interference to the AM signal.

The NAB took issue with one of the FCC's possible solutions; allowing individual stations to "negotiate on acceptable levels of interference" (p. 85). Michael Rau, a chief NAB engineer argued that allowing varying interference levels by stations would undermine efforts to maintain high standards in both transmission and reception equipment. In addition, Rau urged the Commission to raise power levels as well. He reasoned: "There will be no change in the public perception in quality by adoption of new standards; there have to be

power increments as well" (p. 85). A weak signal would give listeners the perception that no improvements had been made (p. 85).

By July 1987, nearly 300 stations were estimated to have upgraded with the voluntary NRSC standards. One thousand stations were expected to convert to NRSC by the end of 1987. The average cost for transmission processors was "less than $700" assembled (p. 85), and the NAB in joint agreement with Circuit Research Labs was offering a "filter kit" for around $125 (Zavistovich, 1987b, p. 1). Receiver manufacturers planned to include the standard in 1988 model units (AM uniformity, 1987, p. 85).

At a September meeting of the NRSC, two major conclusions were drawn. First, many in attendance believed a large number of AM stations would have to accept the voluntary NRSC standards to keep the receiver manufacturers interested. Secondly, members of the panel believed that for true success the FCC would have to make the standards mandatory (McGinley, 1987, p. 17).

NAB petitions for FCC rulemaking

On November 6, 1987, the NAB (supported by the U.S. Commerce Department's NTIA) formally petitioned the FCC to initiate a rulemaking proceeding to require mandatory adoption of NRSC preemphasis/deemphasis standards. The NRSC was already heavily involved in the FCC's AM review process. A total of 422 stations were already converted. Sales indicated a trend which would probably result in at least that many more stations in a short period of time. However, that number represented only about 10 percent of all AM stations. Al Sikes, NTIA Assistant Secretary, supported mandatory NRSC standards. He stated in part: "This improvement is too important to be left to voluntary compliance with by the industry" Zavistovich, 1987d, p. 1).

With 441 NRSC-equipped AM stations by December 1987, the focus turned to receivers. There was some doubt that receiver manufacturers would be willing to build high fidelity receivers without including AM stereo capability. The marketplace had yet to filter out a standard from between Kahn and Motorola. What would be the purpose of developing and designing an improved AM receiver, only to turn around and have to redesign to include AM stereo (Zavistovich, 1987e, p. 3)? It obviously made more sense to wait and take care of the entire situation at one time. The problem was a lingering one. Since the inception of the marketplace in 1982, receiver manufacturers and station owners alike had been reluctant to pick a system at the risk of that system becoming obsolete. Much money could be lost should a decision be reached in error. Still, there had to be a breakthrough for the sake of AM. The NAB, as it had with the voluntary preemphasis/deemphasis standards, decided to design a radio incorporating the NRSC standards, multisystem AM stereo capability, and the best FM technology available (Zavistovich, 1988a, p. 10).

Having responded to the NAB's petition by opening a notice of inquiry into AM improvement, the FCC set a deadline of December 17, 1987, for responses to questions concerning station assignments, technical issues, 10khz bandwidth limits, and preemphasis/deemphasis. The NAB wanted to test receivers and other technology emerging in the quest to clean up AM broadcasting and needed more time to deal with the station assignments and technical issues, preferably at least four months. The FCC obliged by extending the deadline until June 17, 1988, for comments and August 17 for replies. The deadline for the latter two questions was set for February 1, 1988 for comments and March 1 for replies (FCC stretches, 1987, pp. 53-54).

The number of NRSC stations continued to rise steadily, with a reported total of 523 by mid-January (Carter, 1988a, p. 7). As the number grew, receiver manufacturers warmed to the notion of designing better units. Interestingly, the strongest supporters of the NRSC standard tended to be those manufacturers which were early pioneers in building and marketing AM stereo receivers, such as General Motors' Delco Division, Sony, Sanyo, and Sansui. Nonetheless, a large majority of receiver makers remained hesitant to forge ahead without an AM stereo standard as well (Zavistovich, 1988b, p. 18).

Comments to the FCC's AM inquiry

In comments filed in response to the FCC's notice of inquiry into AM improvement, the NRSC preemphasis/deemphasis standards and 10khz bandwidth proposals received strong broadcast industry support. The majority of respondents viewed the standards important enough to merit mandatory rather than voluntary status. To benefit from the changes as fully as possible, AM operators should not be allowed to delay improvement so as to force receiver manufacturers to act. CBS called the moves toward AM improvement "the most wide-ranging and significant . . . proceeding since the 1930's" (Broadcasters tell, 1988, p. 58).

By the end of March 1988, 686 stations had upgraded to NRSC standards, but many AM broadcasters still rejected transmission as the problem. Rather, many cited the problem as inadequately built receivers (NAB radio, 1988, p. 82).

The FCC's NRSC-2

In April 1988, a possible conflict arose between the FCC and the NRSC. The FCC proposed to begin a rulemaking proceeding possibly to include both the NRSC audio standards and an RF mask (called NRSC-2

by the Commission) not endorsed by the NRSC. The RF mask, which "addresses the signal from the transmitter out," was not considered by the NRSC to be advanced enough to be included in an FCC rulemaking (FCC to include, 1988, p. 1). The NRSC was not opposed to such a mask if it were properly done. One NRSC committee member stated: "It (the RF mask) is simply not ready for consideration by the FCC" (p. 3). The Commission was expected to proceed with a rulemaking in some form in the Summer of 1988 (p. 3).

June 20, 1988, the FCC began its expected rulemaking, complete with the RF mask (FCC acts, 1988, p. 1). Members of the NRSC were less than happy about the inclusion of the RF mask. One NRSC member said: "We need to make the audio standard law now, and we need to certainly consider the mask as a standard in the future. It's very important that we establish the audio standard and it be written into law so that . . . [it is] the standard by which we build receivers" (p. 10). NRSC members supported the importance of RF mask, but still preferred to delay its introduction.

FCC Chairperson Dennis Patrick seized the opportunity to answer critics' claims of FCC insensitivity to the AM band, particularly in light of the AM stereo debacle. Patrick emphasized that the Commission would assist AM when warranted. He stated:

> I would add . . . for you skeptics out there that this item suggests that the Commission will not shy away from the adoption of technical standards where it is demonstrated that we can advance the public interest in a particular area doing so. We have by this item proposed a technical standard which I think will go a long way toward improving the quality of the AM signal if it is ultimately adopted. It's a good day for the AM service. (p. 10)

Deadline for comments about the rulemaking proceeding was set for November 22, 1998, with the reply comment deadline December 22 (Gross, 1988b, p. 13). The NRSC moved quickly to decide what action

should be taken on the FCC's insistence on including the RF mask as NRSC-2. The NAB committee decided to ask for NRSC-1 to take effect January 1, 1980, and for NRSC-2 to be delayed until 1994. There was concern because of so demand being placed on AM broadcasters all at once. The NRSC committee members reasoned the FCC should listen to them, because without their efforts there probably would have been no proceeding in the first place (p. 13).

FCC begins four AM rulemaking proceedings

The FCC on October 13, 1988, began four other rulemaking proceedings on nighttime operations, nighttime protection, skywave field strength, and groundwave field strength (Carter, 1988e). FCC Chairperson Dennis Patrick explained the proceedings arose from the technical review as ways to help AM become more competitive (p. 21).

Meanwhile, the NAB and other broadcast industry players were busily preparing comments about the NRSC-1 and NRSC-2 FCC rulemaking proceeding due by November 22. The NAB was preparing an argument that those stations already in voluntary use of NRSC-1 were, in fact, also on track for compliance with NRSC-2. NAB engineer Stan Salek explained: "Having the NRSC audio standard in place, stations would be able to have the time to analyze and make the equipment acquisitions and corrections necessary to fully comply with the RF emission standard" (Carter, 1988f, pp. 1, 3). In other words, some stations would be more advanced than others and need less improvement than others. By taking a two-phase approach, stations would have time to assess degree of strengths and weaknesses.

Broadcaster comments submitted by the FCC's November 22 deadline were overwhelmingly in favor of adopting NRSC-1. One basic reason was offered in support of delaying NRSC-2. The general

consensus indicated that, while both proposals were complementary, NRSC-1 would be easier and more economical to achieve by January 1, 1990. The NAB commented: "If one AM standard were to be implemented, the least burdensome and most effective place to impose bandwidth restrictions is at the audio end (NRSC-1), not the transmission end (NRSC-2)" (AM broadcasters, 1988, p. 62). The NAB added:

> NAB strongly supports the 'presumptive compliance' approach whereby compliance with NRSC-1 would establish a presumption of compliance with NRSC-2. In addition, NAB suggests that the Commission revisit this arrangement at a future date to determine whether mandating compliance with NRSC-2 is economically and practically feasible to AM broadcast licensees. (p. 62)

Deadline for all reply comments was set for December 22, 1988 (p. 62).

Also in December comments were filed in response to the FCC's other four rulemaking notices, broadcasters tended to agree that plans for action on nighttime operations, nighttime protection, skywave field strength, and groundwave field strength should all be merged into one proceeding. In general, broadcasters believed the rules should be imposed but not in a "piecemeal" manner (Broadcasters want, 1988, p. 94). The NAB wrote: "It could be unfair to some segments of the AM industry if piecemeal implementation of changes to the Commission's technical standards permitted facility modifications that would not be permitted once the totality of revisions occurred" (p. 94).

In January 1989, the NTIA publicly supported the FCC's intentions to require both NRSC-1 and NRSC-2. In disagreement with other broadcast industry players who urged delay of NRSC-2, NTIA head Al Sikes stated in a letter to FCC Chairperson Dennis Patrick: "NTIA agrees with the Commission's conclusion that adoption of the emission limitation standard is the most effective method of reducing adjacent channel interference" (NTIA likes, 1989, p. 77).

General Motors's Delco Division announced in January that the

first NRSC-compliant receivers would be ready in 1990. Other receiver manufacturers indicated a similar timetable. Lack of such receivers had been a frustrating point for the NAB and AM operators. While many stations had upgraded to the standards, receivers had been reluctant to follow (Carter, 1989, p. 13).

Aside from technical interference, another major problem for AM was the overcrowded band. Because of the proliferation of AM stations, many signals overlapped. To rectify the problem, the FCC apparently planned to begin a proceeding which one FCC official said would result in "thinning the ranks of the AM band" (AM population, 1989, p. 9). At an open meeting on February 22, 1989, the Commission confirmed plans to help eliminate overlap problems. Several ideas were proposed, including modification of coverage areas, stricter application approval guidelines, and allowing existing stations to go "dark" (FCC comes, 1989, p. 33).

As for modification of coverage areas, the Commission suggested some stations may be allowed to increase power to service a larger area, while other stations would be required to contract coverage. For instance, there would be negotiation between two or more stations to achieve the greatest enhancement in service to be offered by both. For instance, the power adjustment could be facilitated in return for monetary or other consideration. Secondly, future station licensing would require an agreement by parties to abide by the restrictions. Potential licensees, when acquiring a station by whatever means, would have to accept the restrictions. FCC Commissioner Patricia Diaz Dennis explained: "By accepting contingent applications, we would give stations more flexibility in adjusting their service areas" (p. 33). Finally, stations which were not doing as well could be bought by other

stations and taken off the air for good (p. 33). The combined result would be fewer stations offering a better quality signal to possibly larger coverage areas with limited interference. Commissioner Dennis said:

> By deleting radiation and protection rights for stations that go dark, we would finally be able to end our counterproductive practice of licensing replacement stations that do not meet our current interference criteria. Listeners could benefit from the emergence or more high-power AM stations that have the facilities to cover an entire market and the resources to compete effectively. (p. 33)

The Commission as a whole believed the changes would benefit AM radio. Commissioner James Quello said: "Anything that will help AM I'm for" (p. 33). Chairperson Dennis Patrick said the Commission had altered its focus from quantity to "quality" (p. 33). Commissioner Dennis explained: "The FCC cannot save AM in a single proceeding. We can, however, try to create conditions in which AM stations have the opportunity to compete effectively" (p. 33).

The FCC chooses NRSC-2 over NRSC-1

Surprisingly, on April 12, 1989, the FCC went against broadcaster sentiment, unanimously deciding to require AM stations to employ NRSC-2 beginning June 30, 1990. Those stations which previously and voluntarily complied with NRSC-1 were given a June 30, 1994, deadline. Said NRSC-1 stations would be assumed to be in compliance with NRSC-2 for a five-year grace period. Total conversion, if not already achieved, would be expected by the 1994 date.[6]

The Commission was reluctant to support NRSC-1, believing it to be ineffective, unstable, and restrictive to flexibility. Broadcasters disagreed, citing NRSC-1 as more economical and more effective overall than NRSC-2. For instance, upgrading to NRSC-2 would cost from about $1800 to $20,000 as opposed to $400 to $700 for NRSC-1. Both the

Commission and broadcasters agreed that both NRSC-1 and NRSC-2 would accomplish (not quite, but very nearly) the same objectives (FCC takes action, 1989, p. 54). On the surface, it is puzzling that the FCC would choose the more expensive alternative.

Obviously, the Commission realized that requiring both NRSC-1 and NRSC-2 would be too much of a financial burden on struggling AM stations. If, in fact, the sum of the parts was greater than NRSC-1 and NRSC-2 individually, the FCC could get both improvements accomplished by picking the more expensive. Broadcasters who had not voluntarily complied with NRSC-1 would need to raise a tremendous amount of capital to install NRSC-2 equipment by June 30, 1990. The enormous cost could, however, be delayed for four years by spending a minimum of $400 to comply with the voluntary NRSC-1 -- in effect, buying the grace period for a nominal amount. Should the majority of AM stations choose to delay the NRSC-2 requirements until the 1994 deadline, the Commission would have accomplished near total compliance with both NRSC-1 and NRSC-2 within five years.

Such a move would also encourage manufacturers to design and build higher quality AM receivers. With the knowledge that most AM stations would be compliant by mid-1994 with at least one, and possibly both, NRSC standards, there would be little gamble in forging ahead. In contrast, with no government standard ever set, AM stereo was considered too much of a risk.

With mandatory NRSC-2, the outlook for AM stereo looked much brighter. In the few weeks following the FCC's decision, Motorola's C-QUAM was ordered by several stations. In addition, Motorola and other manufacturers were negotiating package deals to include both AM stereo and NRSC capabilities (Radio, 1989, p. 43).

Discussion

Where the FCC succeeded with FM radio, it failed with AM. In the late 1950s, the Commission realized FM needed a catalyst in becoming competitive. Already possessing a tremendous sound advantage over AM, FM was further enhanced by stereo. Within 15 years FM made its first serious challenge to its competition; in 20 years it drew even; and, in 25 years it dominated 70 percent of the radio audience. The first 15 years could be primarily attributed to the lack of FM receivers.

Because most audio equipment is a long-term investment, many consumers were obviously reluctant to replace existing AM-capable receivers with AM-FM units. The same was true for AM station operators, who refused to take seriously any FM threat. However, as FM stations and receivers proliferated, more and more listeners were exposed to the delightful sound quality and the resultant growth was exponential. By the end of the 1970s, it became painfully apparent to AM operators that something must be done.

A portion of the FCC's AM stereo system selection criteria was was based on experimental tests using such technology under real circumstances. For instance, the Commission's researchers installed the five proposed AM stereo systems at various AM stations. Upon hearing the result, the Commission likely was unimpressed with any of the systems given the horrible existing AM technology.

It makes sense that the FCC should have examined general AM improvement before consideration of stereo. By building a proper foundation for quality sound, stereo could have later been added as a true, and perhaps impressive, enhancement. Unfortunately, the perfect scenario did not occur.

Through the years, the FCC has continually refused to revisit its marketplace decision and set an AM stereo system standard. Many in the broadcast industry criticized the Commission for being negligent in its appointed duties as technological regulator. Perhaps the real criticism should have been shared by both the FCC and the AM industry for failure to upgrade gradually over the 60-year history of the medium. Had AM technology been up to par, the Commission could have had a much better chance to select the proper stereo system in the first place. Of course, the FCC should have never allowed AM radio to degenerate into such a sad state of condition.

In the latter part of the 1980s, the FCC addressed critical issues, such as interference and band overcrowding, and attempted to solve the problems categorically. FCC involvement was not unsolicited, however. It took the NAB, with support from stations and receiver manufacturers, to finally convince the Commission to act. No matter the reasons, something positive for AM was in motion.

For the AM medium to survive and even become competitive again, the AM industry must take advantage of the FCC's newly found interest in it. By instituting NRSC-2, the Commission has given a boost to AM's chances as never before. As with FM in its struggle to gain parity, the process for AM's revitalization will take a number of years. As stations upgrade and consumers have available to them the improved receivers, we will be better able to predict the future of AM radio.

NOTES

[1] Preemphasis/Deemphasis standards defined: Preemphasis is the stabilization of "the amount of . . . or boosting of audio highs . . . commonly practiced by stations" (AM uniformity, 1987, p. 85). Deemphasis is "the subsequent attenuation in the receiver to restore flat frequency response" (p. 85).

[2] The NAB later withdrew its kit from the market after learning several other manufacturers were also going to market such items. Michael Rau, NAB engineer, said: "Why should we do it if somebody else will" (Zavistovich, 1987c, p. 3). The NAB is an interest group and not ordinarily a marketer of audio equipment. The organization became involved in the venture only to assist those broadcasters who could not afford to install the more expensive units available (p. 3).

[3] One of the problems for AM stereo was the reluctance of stations to install a stereo system. As a result, receiver manufacturers interpreted a lack of interest for the innovation and were hesitant to continue designing and building AM stereo compatible receivers.

[4] The NAB in February 1988 altered the methodological approach in its survey. The sample was enlarged and taken from a broader geographical area representing more of the U.S. Musical styles to be used were rock and country (AM action, 1988, p. 132).

[5] NRSC-1 "limits the boosting of the high frequencies in audio and limits the bandwidth of audio to 10 khz prior to modulation and transmission," while NRSC-2 "limits the emissions during transmission" (FCC takes action, 1989, p. 54). In effect, NRSC-1 reduces input interference and NRSC-2 reduces output interference (p. 54). The Commission apparently presumed that elimination of output interference would also take care of the input interference.

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